Quality & Dimensions of the Quality
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BASIC CONCEPTS OF QUALITY

QUALITY
QUALITY CONTROL
QUALITY ASSURANCE
QUALITY MANAGEMENT
TOTAL QUALITY MANAGEMENT
ISO SYSTEM
QUALITY

is the totality of features and characteristics of a product that bears on it’s ability to satisfy the stated or implied needs -- ASQC
What is Quality?

- User-based: “In the eyes of the beholder”
- Manufacturing-based: “Right the first time”
- Product-based: Precise measurement
Dimensions of Quality

- Performance
- Aesthetics
- Special features: convenience, high tech
- Safety
- Reliability
- Durability
- Perceived Quality
- Service after sale
Importance of Quality

- Lower costs (less labor, rework, scrap)
- Motivated employees
- Market Share
- Reputation
- International competitiveness
- Revenues generation increased (ultimate goal)
QUALITY CONTROL

is the operational techniques and activities that are used to fulfill the requirements for quality.
Quality and customer expectations

- Quality is also defined as **excellence** in the product or service that fulfills or exceeds the expectations of the customer.
- There are **9 dimensions of quality** that may be found in products that produce customer-satisfaction.
- Though quality is an abstract perception, it has a quantitative measure—\( Q = \frac{P}{E} \),
- where \( Q = \text{quality} \), \( P = \text{performance} \) (as measured by the Mfgr.), and \( E = \text{expectations} \) (of the customer).
## Quality in different areas of society

<table>
<thead>
<tr>
<th>Area</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airlines</td>
<td>On-time, comfortable, low-cost service</td>
</tr>
<tr>
<td>Health Care</td>
<td>Correct diagnosis, minimum wait time, lower cost, security</td>
</tr>
<tr>
<td>Food Services</td>
<td>Good product, fast delivery, good environment</td>
</tr>
<tr>
<td>Postal Services</td>
<td>fast delivery, correct delivery, cost containment</td>
</tr>
<tr>
<td>Academia</td>
<td>Proper preparation for future, on-time knowledge delivery</td>
</tr>
<tr>
<td>Consumer Products</td>
<td>Properly made, defect-free, cost effective</td>
</tr>
<tr>
<td>Insurance</td>
<td>Payoff on time, reasonable cost</td>
</tr>
<tr>
<td>Military</td>
<td>Rapid deployment, decreased wages, no graft</td>
</tr>
<tr>
<td>Automotive</td>
<td>Defect-free</td>
</tr>
<tr>
<td>Communications</td>
<td>Clearer, faster, cheaper service</td>
</tr>
</tbody>
</table>
What is Quality?

- Conformance to specifications (British Defense Industries Quality Assurance Panel)
- Conformance to requirements (Philip Crosby)
- Fitness for purpose or use (Juran)
- A predictable degree of uniformity and dependability, at low cost and suited to the market (Edward Deming)
- Synonymous with customer needs and expectations (R J Mortiboyes)
- Meeting the (stated) requirements of the customer—now and in the future (Mike Robinson)
- The total composite product and service characteristics of marketing, engineering, manufacturing and maintenance through which the product and service in use will meet the expectations by the customer (Armand Feigenbaum)
What is Quality?

- “The degree to which a system, component, or process meets
  (1) specified requirements, and
  (2) customer or users needs or expectations” – IEEE

- The totality of features and characteristics of a product or service that bears on its ability to satisfy stated or implied needs” – ISO 8402

- Degree to which a set of inherent characteristics fulfils requirements – ISO 9000:2000
Definitions of Quality

- Transcendent definition: excellence
- Product-based definition: quantities of product attributes
- User-based definition: fitness for intended use; meeting or exceeding user expectations
- Value-based definition: quality vs. price
- Manufacturing-based definition: conformance to specifications
More about Quality

- Realistic but demanding STANDARDS;
- Getting things RIGHT FIRST TIME; ‘It costs less to prevent a problem than it does to correct it’
- Influences the relationship with CUSTOMERS;
- Influences how COMPLAINTS are dealt with;
- Something to do with how things LOOK and FEEL.
Modern Importance of Quality

“The first job we have is to turn out quality merchandise that consumers will buy and keep on buying. If we produce it efficiently and economically, we will earn a profit.”

– William Cooper Procter
Deming’s 14 Principles

1. “Create Constancy of Purpose”
   - Define the problems of today and the future
   - Allocate resources for long-term planning
   - Allocate resources for research and education
   - Constantly improve design of product and service

2. “Adopt A New Philosophy”
   - Quality costs less not more
   - Superstitious learning
   - The call for major change
   - Stop looking at your competition and look at your customer instead

3. “Cease Dependence On Inspection For Quality”
   - Quality does not come from inspection
   - Mass inspection is unreliable, costly, and ineffective
   - Inspectors fail to agree with each other
   - Inspection should be used to collect data for process control
Deming’s 14 Principles.

   - Price alone has no meaning
   - Change focus from lowest initial cost to lowest cost
   - Work toward a single source and long term relationship
   - Establish a mutual confidence and aid between purchaser and vendor

5. “Improve Every Process Constantly / Forever”
   - Quality starts with the intent of management
   - Teamwork in design is fundamental
   - Forever continue to reduce waste and continue to improve
   - Putting out fires is not improvement of the process

6. “Institute Training”
   - Management must provide the setting where workers can be successful
   - Management must remove the inhibitors to good work
   - Management needs an appreciation of variation
   - This is management’s new role
Deming’s 14 Principles.

7. “Adopt And Institute Leadership”
   ➢ Remove barriers to pride of workmanship
   ➢ Know the work they supervise
   ➢ Know the difference between special and common cause of variation

8. “Drive Out Fear”
   ➢ The common denominator of fear:
     ➢ Fear of knowledge
     ➢ Performance appraisals
     ➢ Management by fear or numbers

9. “Break Barriers Between Staff Areas”
   ➢ Know your internal suppliers and customers
   ➢ Promote team work

10. “Eliminate Slogans, Exhortations And Targets”
    ➢ They generate frustration and resentment
    ➢ Use posters that explain what management is doing to improve the work environment
Deming’s 14 Principles.

11. “Eliminate Numerical Quotas”
   ➢ They impede quality
   ➢ They reduce production
   ➢ The person’s job becomes meeting a quota

12. “Remove Barriers That Rob Pride Of Workmanship”
   ➢ Performance appraisal systems
   ➢ Production rates
   ➢ Financial management systems
   ➢ Allow people to take pride in their workmanship

13. “Institute Programs For Education And Self Improvement”
   ➢ Commitment to lifelong employment
   ➢ Work with higher education needs
   ➢ Develop team building skills

14. “Put Everybody In The Company To Work For This Transformation”
   ➢ Struggle over the 14 points
   ➢ Take pride in new philosophy
   ➢ Include the critical mass of people in the change
QUALITY DOES NOT OCCUR BY ACCIDENT

- What does the customer actually want?
  - Identify, understand and agree customer requirements

- How are you going to meet those requirements?
  - Plan to achieve them
Quality Improvement Tools

- Brainstorming
- Nominal Group Technique
- Cause & Effect
- Flow Diagram
Brainstorming

- Everyone participates
- Go round robin and only one person speaks at a time
- No discussion of ideas
- There is no such thing as a dumb idea
- Pass when necessary
- Use “BIG” yellow sticky notes and write only 1 idea per sticky note
- One person assigned as scribe
- For a complicated issue, the session could last 30–45 minutes…or longer!
Seven Problem Solving Tools

- Cause-and-Effect Diagrams
- Flowcharts
- Checklists
- Control Charts
- Scatter Diagrams
- Pareto Analysis
- Histograms
Control chart – illustration of construction

X-chart  Copper

Central line

Warning limit

Action limit

Control value
When to Take Action?

- One point plots outside the Action Limits.
- Two consecutive points plots between the Warning and Action Limits.
- Eight consecutive points plot on one side of the Center Line.
- Six points plots steadily increasing or decreasing.
- When an unusual or non-random pattern is observed.
When to Take Action?

Month

-4 -3 -2 -1 0 1 2 3 4
When to Take Action?

![Chart showing month vs. value with a peak and decline]
When to Take Action?
Cause-and-Effect Diagrams

- Called **Fishbone Diagram**
- Focused on identifying the causes of quality problem
Example: Delayed Flight Departures

Equipment

Personnel

Other
- Aircraft late to gate
- Late arrival
- Gate occupied
- Mechanical failures
- Late pushback

- Gate agents cannot process passengers quickly enough
- Too few agents
- Agents undertrained
- Agents unmotivated
- Agents arrive at gate late
- Late cabin crews
- Late or unavailable cabin crews
- Late or unavailable cockpit crews
- Poor announcement of departures
- Weight and balance sheet late
- Delayed check-in procedure
- Confused seat selection
- Passengers bypass check-in counter
- Checking oversized baggage
- Issuance of boarding pass

Material
- Late baggage to aircraft
- Late fuel
- Late food service
- Acceptance of late passengers
- Cutoff too close to departure time
- Desire to protect late passengers
- Desire to help company

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Procedure
Brainstorm Results

Building a Cause & Effect Diagram

Turnover in staff

Materials
- Lack of office space
- Restrictive budget

Procedures
- Escorting clients to appointments and having to wait
- Paperwork overwhelming

Policies
- Location
- No policy on staff screening

People
- "Back-biting" environment
- Burnout
- Lack of supervision
- Inadequate training
- Minimal benefits

Escorting clients to appointments and having to wait
Flowcharts

- Used to document the detailed steps in a process
- Often the first step in Process Re-Engineering
Example: Process at Departure Gate

1. Passenger Arrives
2. Ticket For Flight
   - Yes: Excess Carry-on
      - Yes: Check Luggage
      - No: Issue Boarding Pass
3. Excess Carry-on
   - Yes: Wait for Appropriate Flight
   - No: Issue Boarding Pass
4. Issue Boarding Pass
5. Passenger Boards Airplane

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**Checklist**

*Simple data check-off sheet designed to identify type of quality problems at each workstation; per shift, per machine, per operator*

<table>
<thead>
<tr>
<th>Defect Type</th>
<th>No. of Defects</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broken zipper</td>
<td>✔️ ✔️ ✔️</td>
<td>3</td>
</tr>
<tr>
<td>Ripped material</td>
<td>✔️ ✔️ ✔️ ✔️ ✔️ ✔️</td>
<td>7</td>
</tr>
<tr>
<td>Missing buttons</td>
<td>✔️ ✔️ ✔️ ✔️ ✔️</td>
<td>3</td>
</tr>
<tr>
<td>Faded color</td>
<td>✔️ ✔️</td>
<td>2</td>
</tr>
</tbody>
</table>
Pareto Analysis

- Technique that displays the degree of importance for each element
- Named after the 19th century Italian economist
- Often called the 80-20 Rule
- Principle is that quality problems are the result of only a few problems e.g. 80% of the problems caused by 20% of causes
Histograms

- A chart that shows the frequency distribution of observed values of a variable like **service time** at a bank drive-up window

- Displays whether the distribution is symmetrical (normal) or skewed
Six sigma method

- Six sigma method is a TQM process that uses process capability analysis as a means of measuring progress.
- The smaller the standard deviation, the lesser the deviation of the product characteristic from its mean value. If the process has a normal distribution, the upper and lower specification limits are +/- 6 sigma from the mean μ. The non-conformance is 2ppb and the process capability Cp is 2.0 (1.33 Cp is de facto standard.)
- A normal process with mean shifted +/-1.5 sigma from the target value desired has non-conformance of 3.4ppm and process capability index Cpk = 1.5, with 1.0 being the de facto standard.
Bench Marking
Dimensions of Quality
1. Quality of Design
2. Quality of Conformance
3. Quality of Performance.
Internal and External Benefits of Quality

**Internal Benefits**
- Reduces costs
- Increases dependability
- Increases speed
- Boosts moral
- Increases customer retention
- Increases profit

**External Benefits**
- Customer gets correct product or service
- Correct specifications
- Appropriate intangibles
- Customer satisfaction
- Customer retention
Some videos about Quality
Thank you